

Response to Office Action mailed September 15, 2006  
U.S. Application No. 10/657,360

### Amendments to the Specification

Please replace paragraph [0041] with the following amended paragraph:

**[0041]** Tip 43 of igniter 42 ignites heated compressed air 12 and heated fuel mixture 9 to create high temperature syngas in the lower portion of reaction chamber 44 adjacent to struts 38. Heated heavy oil 2 flows into injection reactor 14 through inlets 47 in lower wall 45 and enters reaction chamber 44 through input slots 35 of ignition injector 30 and, upon contact with high temperature syngas, is rapidly subjected to a heavy oil upgrade reaction within reaction chamber 44. The flow of heated heavy oil 2 through input slots 35 results from an eduction force created from the mass momentum generated from the ignition of the gases that generates the syngas. The rapid heavy oil upgrade reaction results predominantly from the vaporization of a portion of heated heavy oil 2 when heated compressed air 12 and heated fuel mixture 9 are ignited, however, an a heavy oil upgrade reaction will also occur within any unvaporized heavy oil within reaction chamber 44. Both the vaporized and any unvaporized upgraded heavy oil flow out of reaction chamber 44 into mixing chamber 46, which is the open area in injection reactor 14 below upper wall 41 but above ignition injector 30. To prevent undesirable secondary reactions, the heavy oil upgrade reaction is rapidly quenched by mixing the outflow of reaction chamber 44 with additional heated heavy oil 2 in mixing chamber 46. The additional heated heavy oil 2 flows through reactor annulus 33 to mixing chamber 46. The resulting upgraded oil mixture 3 flows out of upper wall 41 of injection reactor 14 through outlet 49 by pressure drive after a residence time in mixing chamber 46, preferably of 1 to 60 minutes, and more preferably 2 to 20 minutes, which further stabilizes upgraded oil mixture 3. Injection reactor 14 may operate under mild pressures, generally below 700 psig (4,928 kPa) and preferably below 400 psig (2,859 kPa).

Please rename Table 4 on page 34 as Table 8

Table 4 8

Properties of Liquid	Unit	Athabasca Bitumen	Upgraded Crude
< 350°F (176.7°C) Fraction	wt%	0.00	2.72
< 650°F (343.3°C) Fraction	wt%	12.25	26.58
< 1050°F (565.6°C) Fraction	wt%	54.30	70.83
> 1050°F (565.6°C) Fraction	wt%	45.70	29.17
API Gravity		9.16	11.84
Kinetic Viscosity @40°C	cSt	20,900.00	228.65
Kinetic Viscosity @100°C	cSt	205.00	16.30
MCRT	wt%	12.93	12.17
Toluene Insoluble	wt%	0.03	0.07
Bromine Number	gBr <sub>2</sub> /100g	19.18	19.08
C	wt%	84.50	84.87
H	wt%	10.26	10.74
N	wt%	0.36	0.33
S	wt%	4.83	4.25
Water Content	wt%	0.18	0.14
P-Value			2.03